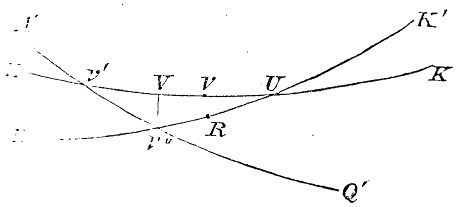
1876MNRAS..36..318.

On the General Precession. By Dr. Friedrich Wilhelm Berg.

Let EK be the ecliptic at the time T, E′K′ the ecliptic at the time T+t, and A′Q′ the equator at the time T+t; also let ν be the equinox at the time T, ν'' the equinox at the time T+t, ν' the equinox at time T+t, on the fixed ecliptic at the time T, and R that point in the ecliptic at the time T+t, which was at the time T in the ecliptic EK in ν. The arc $\nu\nu'$ is now called the Lunisolar Precession, and Rν'' the General Precession, both referring to the time T+t.



Now let us put

$$\nu\nu' = \psi, \quad \mathrm{R}\nu'' = \psi_1, \quad \angle\, \mathrm{U}\nu'\nu'' = \epsilon, \quad \angle\, \mathrm{U}\nu''\mathrm{Q}' = \epsilon_1, \quad \nu'\nu'' = \lambda;$$

and since

$$\mathrm{U}\nu = \mathrm{UR},$$

we obtain from the triangle U$\nu'\nu''$

$$\tan\frac{\lambda}{2}\cos\frac{\epsilon_1+\epsilon}{2} = \cos\frac{\epsilon_1-\epsilon}{2}\tan\frac{\psi-\psi_1}{2};$$

and, consequently, neglecting the third and the higher powers of the time, we have

$$(1) \qquad \psi-\psi_1 = \lambda\cos\epsilon - \lambda\sin\epsilon\tan\frac{\epsilon_1-\epsilon}{2}.$$

Instead of the formula (1), Leverrier, in the *Annales de l'Observatoire de Paris*, vol. ii. p. 172, gives the formula—

$$\psi-\psi_1 = \lambda\cos\epsilon,$$

drawing the arc Vν'' perpendicular to the ecliptic EK, and putting

$$\mathrm{V}\nu' = \psi-\psi_1.$$

But the approximation cannot be admissible, and putting

$$\angle\, \mathrm{K'UK} = \eta, \quad \nu\mathrm{U} = \Pi,$$

we obtain, neglecting the third power of the time—

$$\lambda = \frac{\eta\sin(\psi+\Pi)}{\sin\epsilon} - \frac{\eta^2\sin(\psi+\Pi)\cos\Pi}{\sin\epsilon}\cot\epsilon,$$

$$\frac{\epsilon_1-\epsilon}{2} = \frac{1}{2}\left\{\eta\cos\Pi - \eta\psi\sin\Pi + \frac{1}{2}\eta^2\cot\epsilon\sin^2\Pi\right\},$$

and therefore we obtain, from (1),

$$(2) \quad \psi - \psi_1 = (g+\Gamma) \cot \epsilon . t + \left\{ \left(\nu + a\,(g'+\Gamma') \right) \cot \epsilon - \frac{1}{2} (g+\Gamma)\,(g'+\Gamma') - (g+\Gamma)\,(g'+\Gamma') \cot^2 \epsilon \right\} t^2,$$

where (Leverrier, *loc. cit.*)

$$\eta \sin \Pi = (g+\Gamma)\, t + rt^2,$$
$$\eta \cos \Pi = (g'+\Gamma')\, t + r't^2,$$
$$\psi = at + bt^2 ;$$

and by substituting the numerical values, according to Leverrier (*loc. cit.*), we obtain from (2)

$$\psi - \psi_1 = 0''\cdot1356809\, t - 0''\cdot000221628\, t^2,$$
$$\psi_1 = 50''\cdot23572\, t \quad + 0''\cdot00011282\, t^2.$$

Instead of these values, Leverrier gives (*loc. cit.*)

$$\psi - \psi_1 = 0''\cdot13568\, t - 0''\cdot00022170\, t^2,$$
$$\psi_1 = 50''\cdot23572\, t + 0''\cdot00011289\, t^2 ;$$

while the formula of Leverrier does not contain the term

$$-\frac{1}{2} (g+\Gamma)\,(g'+\Gamma') . t^2.$$

Wilna Observatory,
1876, *Jan.*

Note on the Satellites of Uranus. By E. Neison, Esq.

With the view of ascertaining whether the two outer satellites of *Uranus* were within the reach of a Newtonian reflector of $9\frac{1}{3}$-inch aperture, on the night of April 14, $8^h\ 0^m$ to $9^h\ 15^m$, the telescope was turned on the planet. The air was very steady, and definition very good. After putting *Uranus* into the field of view, this was constricted to a diameter of about 2′, and the neighbourhood of the planet carefully examined for faint stars. After a prolonged and very careful search two were picked up, the planet all the time being kept beyond the field of view. Whilst looking at the fainter of the two, which was only seen with difficulty, the planet accidentally sailed into the field, without however in any manner interfering with the distinctness of this very faint object. It was found to be sensibly as easy to pick up the two stars with the planet in the field as with the planet out.